The Model Engineer

A Journal of Small Power Engineering.

Edited by Percival Marshall. C.I.Mech.E.

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Our Point of View.

The Electrician at Sea--

During the last few months we have often been asked by many young fellows what are the qualifications and prospects far sea-going electricians in both the Navy and the Merchant Service. Many of these young fellows have been bred in station work, testplate work, and similar semi-supervisory duties, and are somewhat, surprised to learn that they would be unacceptable in either service. The sea-going electrical man, like his brother at the steam end, must not only be able to drive plant and to tell others how it is to be arranged and run, but must, not should, be able to carry out any type of repair which may be called fur whilst the vessel is at sea. This means that he must be a practical armature winder, be able to put together and adjust switch-gear, motor starters and resistances, repair radiators and kitchen utensils, and to get these repairs done with expedition, so as to interfere as little as possible with the working of the ship and the comfort of its passengers if a liner. The work is responsible, and for the Navy a severe test in workmanship is insisted on, as well as some elementary ability with the theory of the work. The Merchant Service will not look at a man who has not worked for some time as a dockyard electrician ; nor would thev look at a man who was trained simply in running duties. The work is not unpleasant, in the Merchant Service particularly. It may lead to a fair position, but to the youth possessed of a good technical education and ambitions, the work holds out little enticement. It is a good berth as ship's electrician which carries £400 a year and all found, a very good berth in fact'; whilst in the Navy, unless a man can be contented with a position in life as a highly skilled workman, better perhaps than 90 per cent. of his fellows, and paid perhaps one and a half times a journeyman's wage at the end of many years' service, he will be ill advised to enter the Navy. The life is more confined, subject to far stricter discipline, and also the man is held for a definite term of years, no matter what openings he may see at home or abroad.

-and Afterwards.

The man with ambitions, and particularlv the man who is determined to get to the top of the tree in his own line, should not lock himself up. In the Navy a man must know his place-and keep it. Otherwise he may be uncomfortable. On the other hand, he is fairly sure of constant work, sees the world, sometimes to a greater extent than his Merchant Service colleague, but has considerably more discomfont and less privacy when at sea. Above all, the man in the Merchant Service can leave at the end of any voyage and quit the sea for good, or a year or two, just as circumstances suit him. The man in the royal service cannot do so. Another important matter is that the testimonials given to a man by the Merchant Service give him due credit foe having been the man in sole and responsible charge of his ship's installation, and treat and speak of him as a man holding an official engineering position. The royal service gives him his discharge papers, stating that he has proved himself satisfactorily as an artificer or, in plain English, a workman, and speaks of him as a chief petty officer, and not as an official or officer. This makes a wonderful difference to the worth of the testimonial. The one man is looked upon as having carried manageriai responsibility, whilst the other is considered always to have been under direction.

Models at Croydon.

Some advance particulars concerning the Surrey Handicrafts Exhihition have recently bren put before us, and we are glad to see one or two of the sections amongst the competitions will be of some interest to the model maker and his near relative the scientific mechanic. Entries arc invited for (*a*) mechanical working models, such as steam and petrol engines, waterwheels and turbines, tide and windmills, and also agricultural implements ; (*b*) stationary and architectural models ; and (*c*) marine models—power or sail For juniors under 16 years of age there are two drawing competitions, one class for architectural and the other for mechanical working drawings of a steam, gas or petrol engine. Further, there is one of rather novel conception that will probably give tht judges an opportunity of doing some hard thinking. This class wit! be for, to quote from the prospectus, " The best result for a maximum outlay of one shilling on materials. Regard will be paid both to beauty of design, workmanship, and usefulness. A detailed account of the expenditure must be sent." Last year the show was quite a good one ; and this time it will probably arouse more interest still amongst local model engineers. It will be held at the Public Halls, George Street, Croydon, from Tuesday, October 9, to Friday, October 12 nest. We understand the prospectus will shortly be printed. and may be had from the Exhibition Secretary, Mr. C. F. Hemmingway, 21, High Street, Wimbledon, S.W.19.

* * *

Model Aeroplane Work for 1923.

There is every prospect of model aeroplane work developing considerably during the nest twelve months, if the programme for 1923, which has just been completed by the S.M.A.E., is any indication of what we may anticipate. It includes about a dozen dates for open competitions, and many others are set aside for general and glider-flying with the view of making records. Every Saturday in fact throughout the season will find various experimenters busy in the open with their models. The competitions by the way are arranged to interest in turn the builder of every type of machine. Although the genuine experimenter does not look upon his possible prize list as the ultimate aim and end of his efforts in model work, we are sure the fact that the Society of Model Aeronautical Engineers is now in possession of no less than sixteen cups, will be a matter of considerable interest to many prospective competitors. In addition to these cups, we hear that Dr. Thurston, Mr. F. de P. Green, and Mr. A. F. Houlberg are revealed as the donors of money prizes to be known as the Freshman's Prize, which awards are to be competed for by those who hare not won a first prize. In the report of the past year's activities of the Society, delivered by the Secretary at the last annual general meeting, these, and many other matters of moment to the model aeronautical world, are dealt with. There is one other matter to which we would call special attention, and that is the efforts which are being made to secure the support of model aeronautical engineers in the Provinces. Most of us are well aware of the problematical benefit accruing to the ordinary " Country Member " of any London Society, but nevertheless the fact that a definite programme of events is to be worked to this year should help to encourage those who are beyond easy reach of London, and who can therefore only make a limited number of visits on quite definitely known occasions.

Books Received.

THE HOME RADIO :—How to Make it and Use it. By A. Hyatt Verrill. 60 illus., 116 pp., f'cap 8vo, cloth. (Harper, 1922.) Price 3s. 6d. net (post free, 3s. 9d.).

Contents :-Principles of wireless telephony—Receiving sets-Reading diagrams-Tools and supplies required — Aerials -- Airgaps and lightning switches—Counterpoise—Condensers—Transformers-Ammeters-Inductances and tuning coils—Vario-couplers and Variometers-A simple crystal detector receiving set-Crystal detectors and how to make one-Loose-coupled coils-Amplifiers-Simple vacuum tube receiving set-Regenerative receiving set-Transmission or sending-The simplest sending set-Another simple transmission set-An efficient 5-watt transmitter-Useful things to remember.

RADIO FOR EVERYBODY. By A. C. Lescaboura, Managing Editor of The *Scientific American*. Edited by R. L. Smith-Rose, M.Sc. 163 illus., 320 pp., crown 8vo, cloth. (Methuen, 1922.) Price 7s. 6d. (post free. 8s. 3d.).

Contents :--Elements of radio reception and transmission--Broadcasting in the U.S. of America-Radiotelephony in Great Britain—Receiving equipment-Operating and mastery of the telegraph code-Amplifying-Transmitting dots and dashes of the damped Radio-telegraph —The radio-telephone transmitter and C.W. telegraph transmitter-Unusual uses of Radio—Applications of Radio to business-How to construct simple receiving sets--Radio-telephony of to-day and to-morrow—Index.

E. G. S. (Forest Hill).-There are various kinds of these instruments, but it is somewhat outside our scope to deal with them in these pages.

A Model Steeple Engine.

By Geo. Gentry.

BY the courtesy of its owner, Mr. L. Cozens, of the Society of Model and Experimental Engineers, this model was shown at the recent Exhibitioe at the Horticultural Hall, as a loan exhibit, upon the stand of Messrs. Percival Marshall & Co., but, as it was one among many interesting exhibits, no doubt its unique value was to an extent lost sight of.

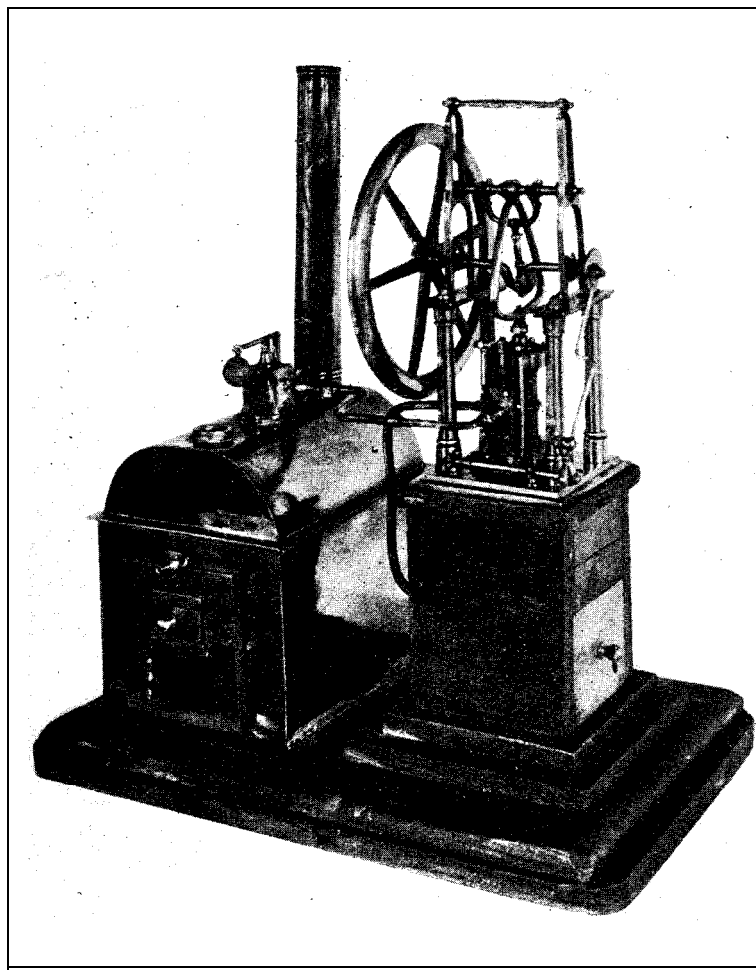


Fig. 1.—A View of the Model Steeple Engine.

The Steeple engine was used in marine paddle practice, and was a type which, in common with the Entablature and Table engines, both of which also had erect cylinders, marked the transition from beam practice to the inverted cylinder reciprocating engines of more modern marine usage. It apparently differed from the table engine proper in the following particulars : Whereas the table engine had an erect cylinder upon a table raised on legs, and drove, via a crosshead above-to which were attached two connecting rods-a crankshaft below it, the steeple engine erect cylinder was mounted upon a low table, and drove a crankshaft above it by a return connecting rod, or rods, from a crosshead above all. It was the only possible form of direct-acting erect cylinder engine to drive a paddle shaft, and keep the cylinder C.G. below that shaft. The side lever engine may be cited as doing this, but this engine was really a form of inverted beam engine, and it therefore cannot claim to be direct acting.

Fig. 1 is a general view of the model at the engine side, and Fig. 2 a similar view at the boiler side. It is not clear what connection the form of boiler on the model had with marine boilers of the period, but it is worth noting here the general construction of this boiler, because, for the age of the model (probably 80 years), it is remarkable, and a far better type for steaming than was generally supplied with the regular pattern brass model of 50 years ago, and less.

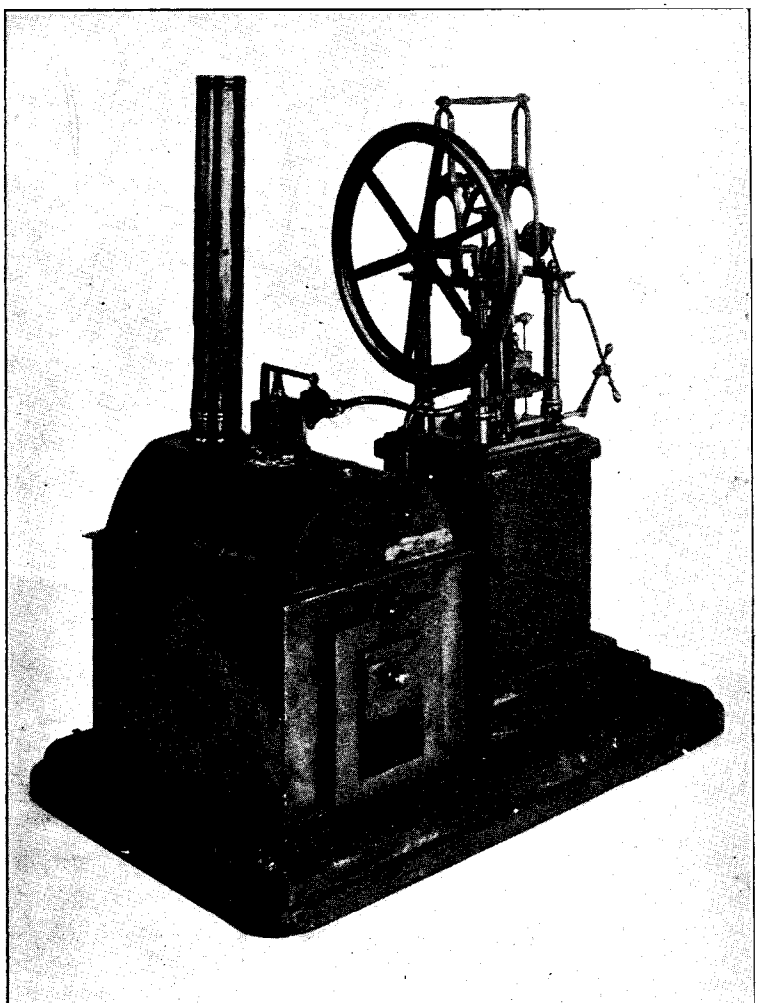


Fig. Z.-The Steeple Engine viewed from the Boiler Side.

Fig. 3 shows two sections of the boiler, which, ail of brass, consists in the first place of a rectangular box, in round figures, $4\frac{1}{2}$ ins. x $3\frac{1}{2}$ ins. x 3 ins. deep, sweated to a baseplate, and surmounted by a rectangular flange, to which it is also sweated. To the inside edges of the rectangular flange is sweated a half elongated cylindrical crown, $4\frac{3}{8}$ ins. long × $1\frac{1}{4}$ ins. deep x $3\frac{1}{4}$ ins. wide. Midway of the lower part, and lengthways of it, passes a rectangular firebox, $1\frac{7}{8}$ ins. high x $1\frac{3}{8}$ ins. wide from an opening in the end plate, at the firing end, to which it is sweated, along the boiler, to within about $\frac{1}{4}$ in. of the front end plate. This box is connected with the top of the crown plate at the chimney end by a $\frac{3}{4}$-in. circular flue, sweated to both, which flue, therefore, supports the firebox, which has a water space upon all sides, and one end. The dome is a rectangular box, about $\frac{5}{8}$ in. cube, surmounted by a weight lever safety valve, and mounted upon a circular

flanged base. Steam is delivered from this dome about halfway up the side, upon the engine side of the boiler. The flue pipe has fitted in it a telescoped tube, 2 ins. long, which, when projecting a half inch above the boiler crown, fakes, a sliding fit, the ¾-in. funnel. The final crown fitting is a screw filler ½ in. in

firebox, as applied to models, was intended to take a rectangular bar of iron made red hot, there being two or more bars kept hot, one replacing the other as that cooled down. He states that he has seen this method of firing boilers in old models. The fire door frame is intended to finish off the boiler in the matter of

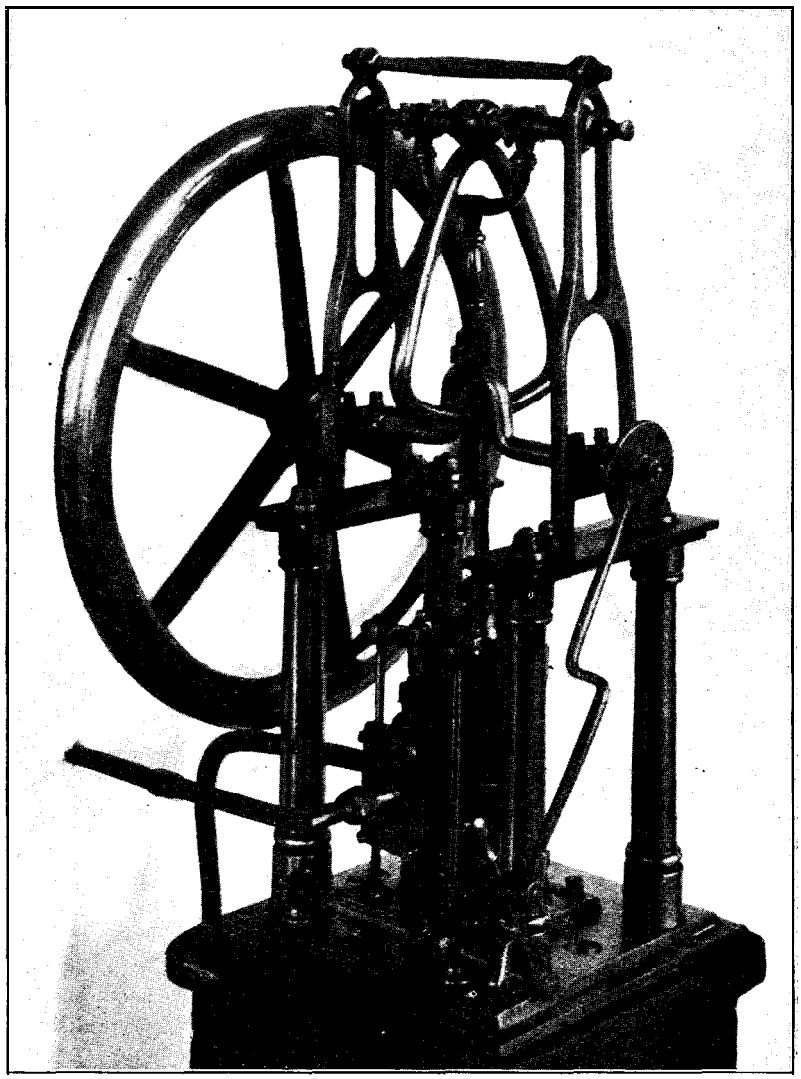


Fig. 4.—Close-up View of Steeple Engine.

the bore. There is also, shown dotted, a fire door frame piece, in the form of a casting, pierced with two rectangular holes, the upper one fitted with a sliding door. This frame is fitted with, projections at the back, and passes, a sliding fit, into the opening of the firebox. A friend of the paper suggests that this form of appearance, but would aid some little in keeping the heat in. As run by Mr. Cozens, the boiler was fired-at a recent exhibition—by a bench form gas blowpipe projecting into the box, and this did the work quite well. About 7-16th in. above the crown of the firebox, at the open end, is fitted a gauge cock, for giving

some idea of the proximity of the water level to that of the firebox crowns. It appears unsafe to allow the water level to get below this crown plate of firebos, but it appears also probable that the water could go well below this level before the solder joints are likely to give, on account of the temperature equalising effect of the steam in the boiler. So much for the boiler.

Fig. 4 is a close up view of the engine, and this, together with Fig. 1, will help to explain it. The engine proper ceases at the baseplate, which is mounted upon a hollow wood plinth 4 ins. high, evidently used to raise the engine cylinder level with the steam supply, and also to show the model off as a stationary engine. The exhaust is turned down into this box, which might therefore be intended to represent some form of condenser. The framing consists of two plates upon each side, forming, in each case, a kind of entablature above a pair of brass columns mounted on the baseplate. The plates carry the slotted guide frames, upon cross bars in which are mounted the main bearing plummer blocks of the crankshaft. Above the piston rod head is an open kite-shaped intermediate rod, which conveys the reciprocating motion to the crosshead above. This form of rod is required to clear its own reciprocations about the crankpin, and connecting rod, and to clear the side throw of the big end and angularity of the connecting rod. The connecting rod is forked, and works on the central crank within the bow of the intermediate rod. This construction of engine was later employed much in small pumping engines, and is generally described as the "Cameron" type, but in these cases the cylinder was inverted, and the bottom end of the open intermediate rod was connected immediately with the head end of a pump rod. Some steeple engines, however, were made with two cranks and double connecting rods, working upon either side of the intermediate rod, which needed only to be slotted to clear its own reciprocations about the shaft, and not to be open or kite shaped.

The model is $9\frac{3}{4}$ ins. high over-all, and has a $4\frac{1}{2}$-in. flywheel. The main dimensions are 1 in. stroke x 7-16th in. bore, or less. The valve stroke is 3-16th in., but the initial stroke, conveyed by a slip disc crank to the valve motion, via a gab-ended connecting rod, is $\frac{1}{2}$ in. The whole of the model is of brass, with the following exceptions, which are of steel: The stretcher bar joining the top of guides; the crosshead including its friction rollers, which run in the guide slots; the crankshaft; piston rod; valve rod; valve motion crosshead, links and shaft; and all the square-headed setscrews, keys and cotters. Such nuts as are fitted are of brass. The cylinder is of correct form, having a space between the port trunk, which carries the steamchest. The glands are screw-in pattern with octagon heads and probably are quite correct.

The model as a whole is built up, and bears evidence of remarkably fine workmanship, in spite of the fact that it has done apparently a

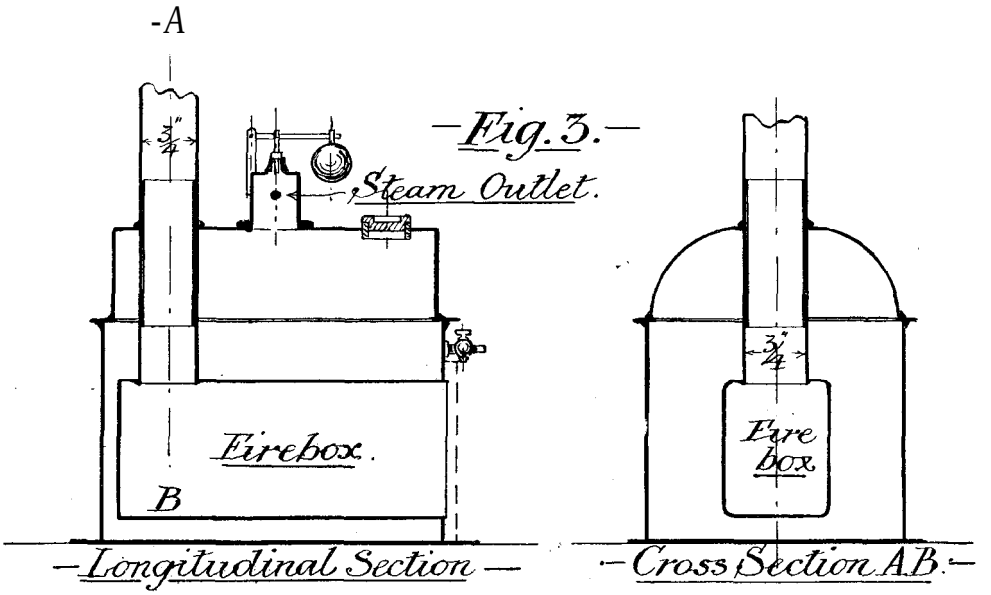


Fig. 3.

Scale Sections of the Brass Boiler of Model Steeple Engine.

lot of running, and is somewhat shaky in its various journals and joints. It is a job far ahead of the later trade types of brass model, as largely sold by instrument makers, opticians, and others. The main points of interest are, however, that it is a model of a steeple engine, and therefore rare, and it is remarkable for being so complete and in miniature, as most models of its reputed date are generally so much larger scale than this has been made. The parts which Mr. Cozens had added to replace those lost or broken are the valve motion connecting rod, the valve and weight of safety valve, and a door to the hollow plinth; the remainder is all original work.

The writer is indebted to Mr. Cozens for kindly lending the model for the purposes of this description, and it may be of interest to note that the date Mr. Cozens ascribes to it may be much earlier, because it appears that it was given to his father from 75 to 80 years ago, and was then, of course, in existence in 'its entirety. He cannot, however, offer any authentic information upon its original ownership, or as to who built it.

L. D. (S. Woodford).—The publication you refer to is now defunct.

Some Notable Attachments for an 8-in. Centre Lathe.

THE half-dozen photographs which we are able to reproduce here are striking examples of how the functions of the lathe may be almost indefinitely expanded until it becomes literally a universal tool. Such jobs as these are not to be evolved in a moment ; they generally represent the labour of years, the product 'in material form of the working of a mind inherently mechanical, and capable of taking infinite pains.

Like many men who are masters in the art of tool making and using, the reader to whom we are indebted for these illustrations is reluctant to write much concerning them, or of his own experiences during a long career of lathe work. What he *has* told us, however, can best be passed on to our readers in his own words :-

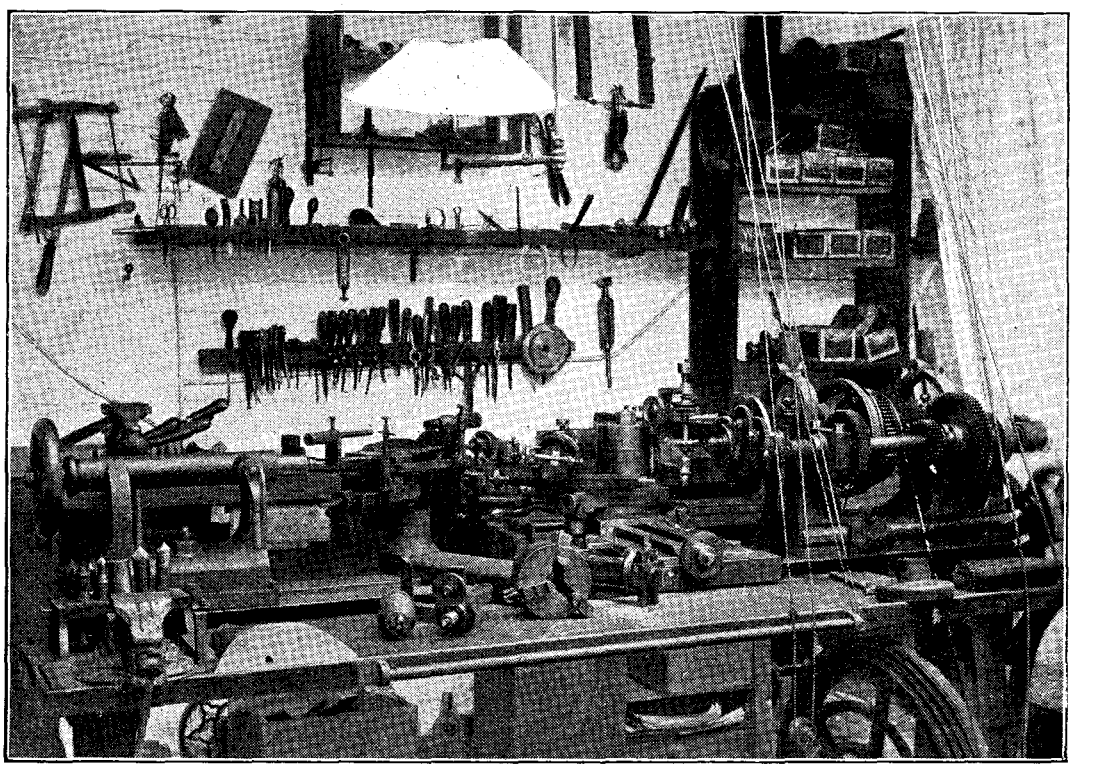


Fig. l.-General View of Back of Lathe, with various Attachments.

1 thought they (the photos) might explain themselves, but as you desire " fuller notes " it may be best to give a few particulars of the special features of my lathe.

It is a copying lathe, 8-in. centres, 5 ft. 6 ins. bed with back gear and screw, having also three spindles in the same headstock. The centre

spindle carries the material to be operated upon, the back spindle carries a medallion to be copied, and the spindle nearest the operator (not shown in the photo) is intended to drive a mill, or steel roller, such as engravers of calico printing rollers use to impress the pattern into the copper rollers. In this lathe arrangement the mill is carried in a specially constructed slide-rest (not in the photo).

The central spindle is used as in an ordinary lathe and has on it a micrometer wheel containing 360 teeth actuated by worm having on its spindle a dial divided into 100 parts, this arrangement gives very accurate divisions for wheel cutting. The worm spindle need only be removed and you have an ordinary lathe.

The slide-rest has a useful arrangement for

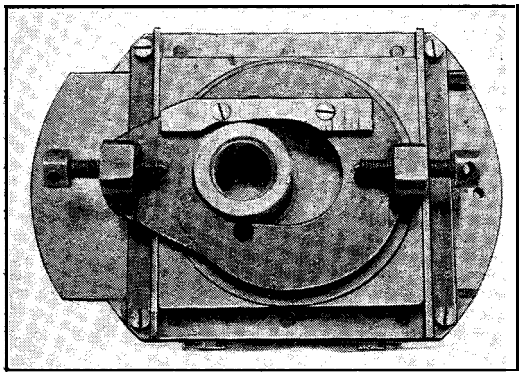


Fig. 4.—Back View of Oval Chuck, showing the Variable Eccentric Attachment.

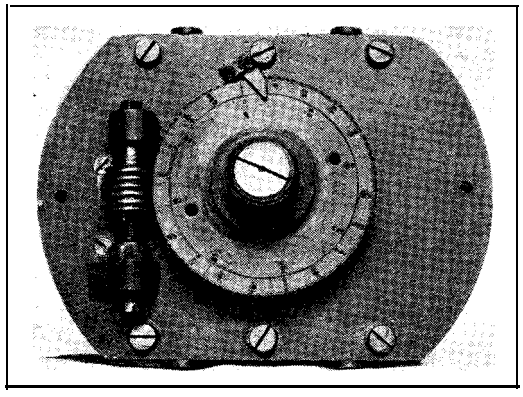


Fig. 5.-Front View of the Oval Chuck, showing Worm Gear Adjustment.

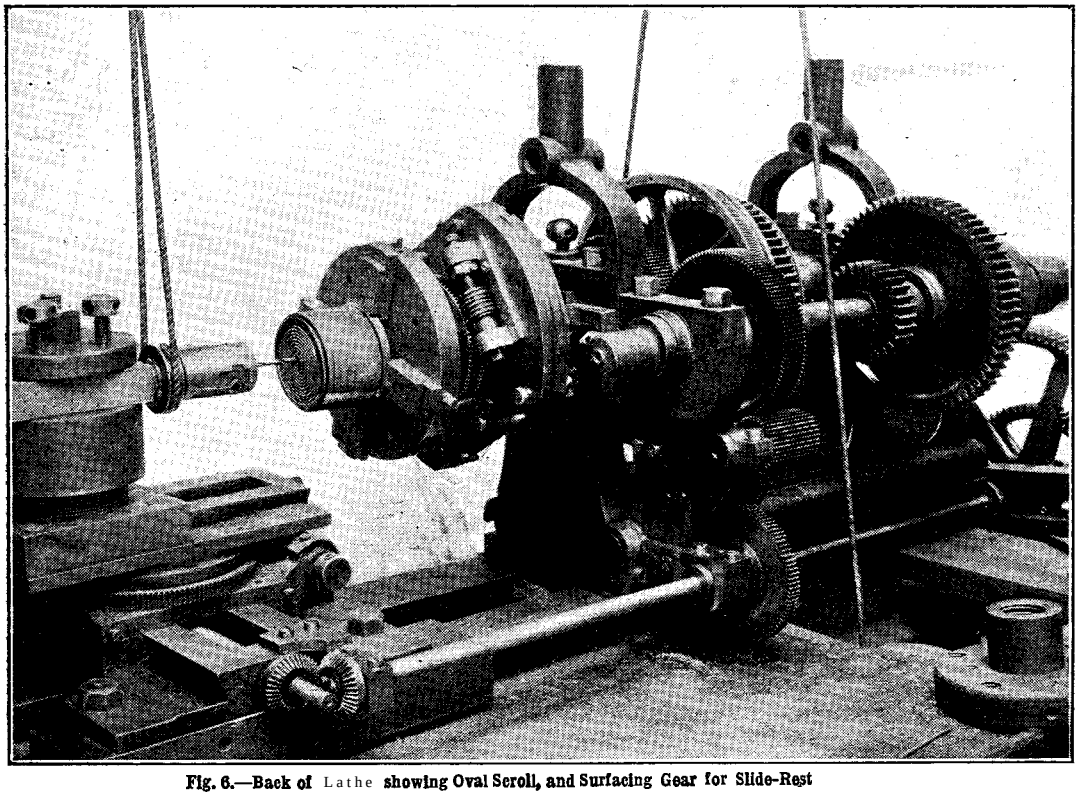


Fig. 6.—Back of Lathe showing Oval Scroll, and Surfacing Gear for Slide-Rest

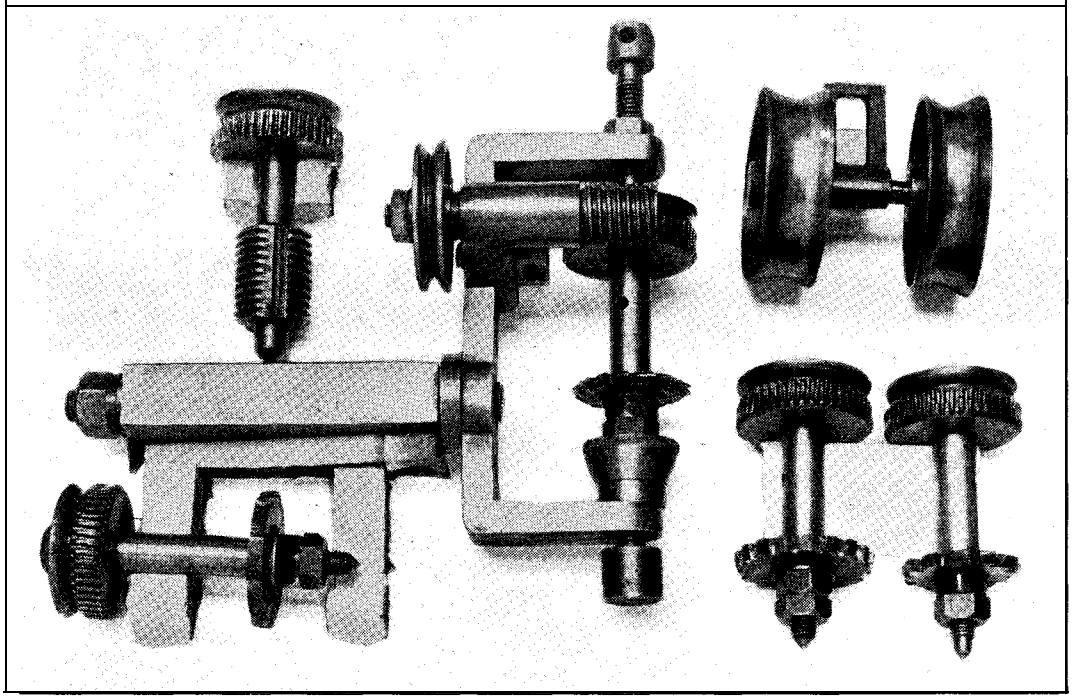


Fig. S.-A Cutter Frame with Worm Geared Drive for Working on Steel. The Hob for Cutting the Worm Wheels is also shown.

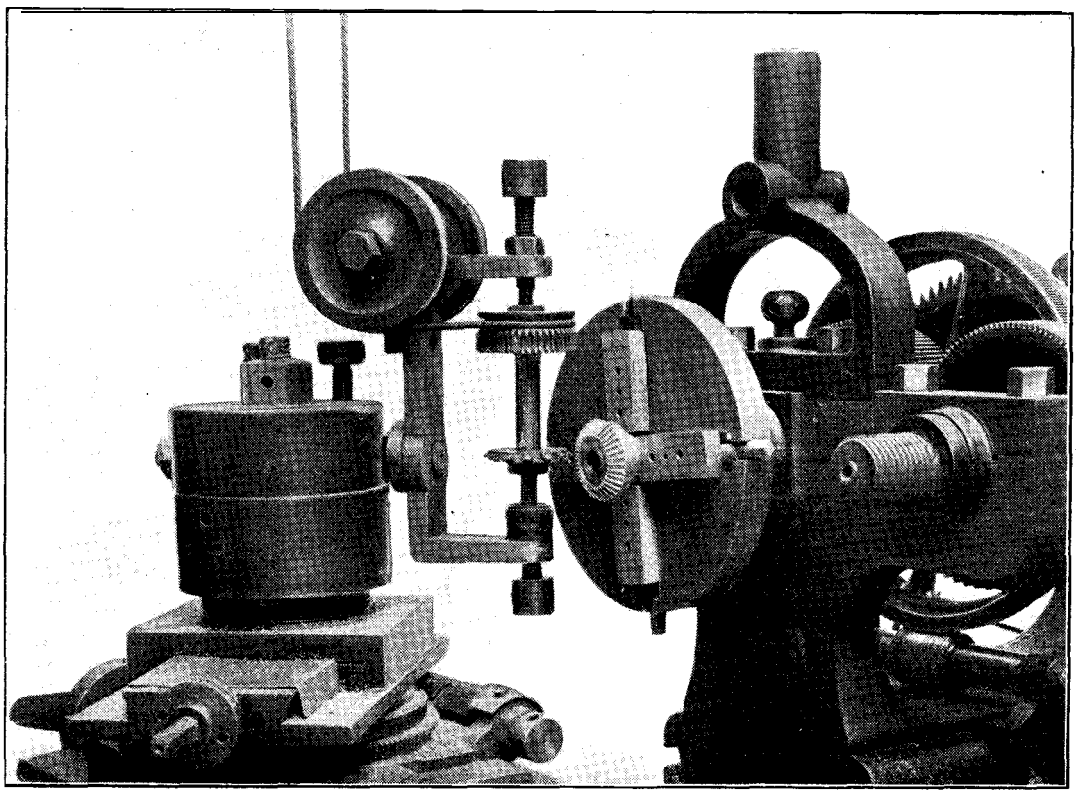


Fig. 8.—A Vertical Cutting Frame Driven from the Overhead.

raising or lowering the tool to a suitable height by means of a screwed turret-no thin strips of metal as so frequently used on ordinary lathes are required. Another useful feature is the setting of the top slide to any angle by means of worm gear.

I.-In the milling arrangement shown in Fig. 7, the turret is removed and a vertical slide, carrying a platform for the work to be milled, is substituted.

II.-In the oval scroll, Fig. 6, it will be seen that the surfacing screw in the slide-rest is geared to the lathe spindle by means of a small sliding

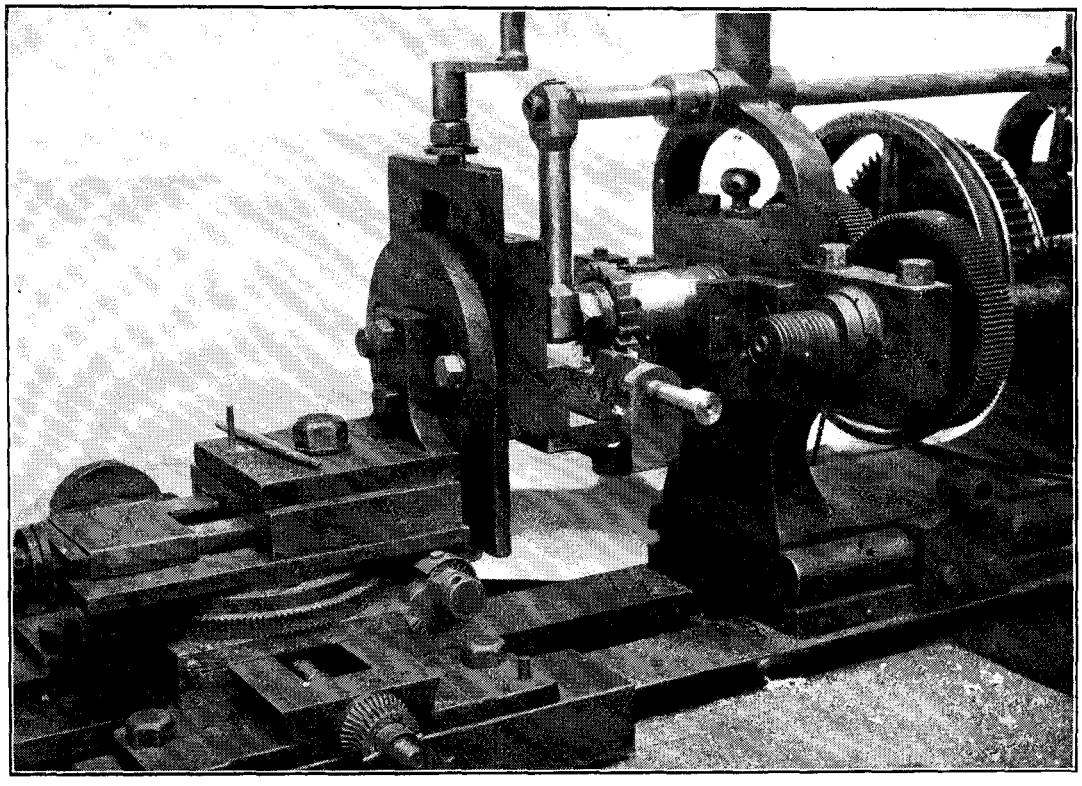


Fig. 7.—Vertical Slide with Platform used in conjunction with the Billing Attachment shown.

shaft and mitre wheels, all of which have been cut in this lathe.

(The oval chuck would of itself require some lengthy explanation, reserved for some future opportunity.)

III.-The vertical cutting frame shown in Fig. 3 is driven from the overhead shaft direct when used for cutting brass by means of a pair of guide pulleys.

IV.—An alternative method, shown in Fig. 2, is adopted when cutting steel, such as fluting taps and reamers. The guide pulleys are removed, and in place thereof a worm, gearing into the worm wheels with which each cutter spindle is provided, is fixed to the cutting frame, its bearing being a double one, the worm at one end, the pulley at the other. The photo shows the hob which cuts the worm wheels when itself is placed in the frame and the blank wheel to be cut is placed on a mandrel between the lathe centre.

Now as to my experiences : After half a century it is somewhat difficult to say why I took up this lathe hobby. Some fortunate circumstance made me acquainted with a Mr. Thomas Forshaw, of Altrincham, a member of the Turner's Company of London, who possessed a Holtzapfel lathe with a great variety of appliances and n-ho used to turn ornamen tal boxes for presentation purposes. This would be about the year 1866.

My present lathe, which I have endeavoured to describe, belonged previously to a Mr. William Hartley, an engineer of Manchester, and came into my possession on the sale of his property by his executors about 1886. I believe it is unique in some respects.

I. C. (Bedwas).—You cannot use this trade mark on home-made apparatus. It is only used by *the* company actually making the goods.

A Design for a Model Compound Condensing Steam Engine-IV.

By "AXLE."

(*Continued from page 299.*)

THE main hearings. Fig. 27, are made from castings of gun-metal. The end bearings are the same, but the centre one is wider. The half-castings should first be machined and soldered at the joint, then bored out to suit the shaft and the sides faced. The square flanges can be filed up to size and the bearings fitted into the pockets of the bedplate. Care should be taken to get the bottom of the bearings bedded evenly on the bottom of the pockets and also the thickness of metal under the shaft the same in all the bearings.

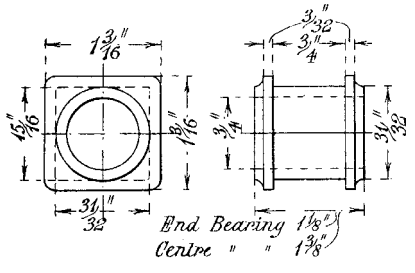


Fig. 27. Main Bearings, C.M.

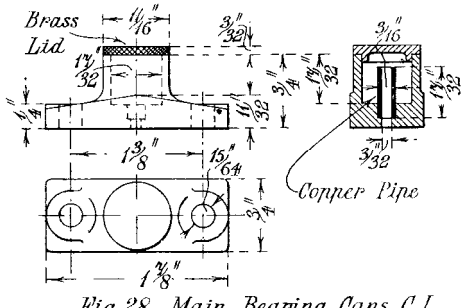


Fig. 28. Main Bearing Caps, C.I.

Details of the Main Bearings and Bearing Caps.

Each half bearing should be bedded on to its corresponding journal. If a little paint is lightly smeared on the shaft it n-ill show the places where the shaft is bearing on the brasses. The shaft should bear evenly along the crown of each half-bearing, the sides of the bearings being eased if necessary.

The main bearing caps are made of cast-iron Each is provided with an oil cap, as shown in Fig. 28. The castings should first be faced up level on the underside and the oil box turned and bored out. The oil chamber is fitted with a piece of copper pipe to form a siphon. A brass lid turned from brass bar and knurled on the flange is fitted to each cap. The caps should be filed up to width to suit the bearings and drilled for the main bearing bolts.

The valve gear is overhung, so that the travel of the eccentrics is greater than the travel of the valve. The reason for using overhung gear is to dispense with the gudgeons and forked eccentric rods required with direct valve gear with double link bars, and using plain eyes on the eccentric rods instead. Of course, should the builder desire direct valve gear, the design can be easily modified.

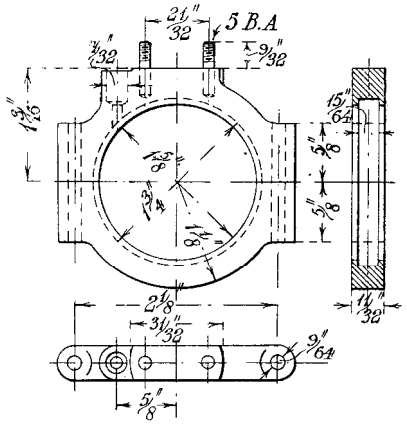


Fig. 29. Eccentric Straps, C.M

Elevations and Plan of the Eccentric Straps.

The eccentric straps, Fig. 29, are made from gun-metal castings. Having obtained the castings they should be filed up at the joints and soldered together in pail-s. Each strap should then be marked off and bored out and faced across the side. The groove in the strap should be slightly wider than the eccentric sheave to obtain a running fit. The strap can then be turned over and the other side faced. Each is drilled to suit two No. 5 B.A. bolts and tapped for two No. 5 B.A. studs for securing the eccentric rods. The nil chamber should be drilled 3-32nd in. and counterbored to 3-16th in. diameter. The eccentric straps should be filed up and polished where not machined.

The eccentric rods, Fig. 30, may be made either from har or forgings. They are turned up bright all over. The eye end is first turned spherical and then drilled, and the sides faced. The foot is drilled to suit the straps. Before bending the rods to obtain the set they should be heated locally with a Bunsen flame or blow-lamp.

The link bars, Fig. 31, are made of mild steel bar bent and filed up to size. The fours bars should first be bent to the correct radius and the holes drilled

near the ends with the four pieces clamped together. The pieces can then be bolted together with fit bolts and filed up to size. Two gauges for the inner and outer radii should be made from sheet steel as a guide in filing the bars. The eccentric rod pins are turned up from mild steel bar and are a tight fit into the **radius** bars, and are secured by 3-64th-in. diameter taper pins, as ● homn. The rear pin carries the drag links shown in Fig. 32, which are held in position with a washer and taper pin at each end. A small forging can be made for the T end of the drag links, one end of which is turned spherical, drilled and faced, and the other end turned and drilled for the connecting links which are turned

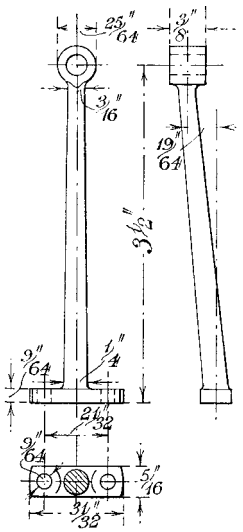


Fig. 30. Eccentric Rods, M.S.

Showing Off-set of the Eccentric Rods.

from ⅜-in. bar. The reversing shaft is 5-16th in. diameter and 7 15-16th ins. long. At the ends are mounted the reversing levers and near the centre is mounted the wormwheel. The reversing levers, Fig. 33, are made of mild steel and have two bosses turned on them, one of which is bored to a tight fit on the reversing shaft, and the other drilled to suit the pin, Fig. 34, upon which are attached the drag links. The levers are finished bright all over. The pins are turned from ⅜-in. bar and have a washer secured with a split pin at one end and a 5-32nd-in. nut at the other.

Two forgings will be required fur the valve spindles shown in Fig. 35. The forging should first be rough turned on the shank to slightly over size. The end which carries the link block should then be turned, drilled and split with a fine saw. The joint thus formed should be filed up, and liners of a thickness equal to the depth of metal removed with the saw fitted. The cap should then be bolted in position and the spindle cleaned out with a ½-in. diameter reamer. The shank can now be finished off to size and screw-cut for a 2 B.A. nut which secures the valve.

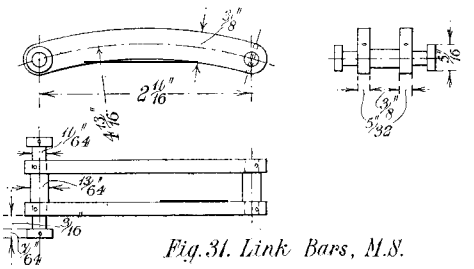


Fig. 31. Link Bars, M.S.

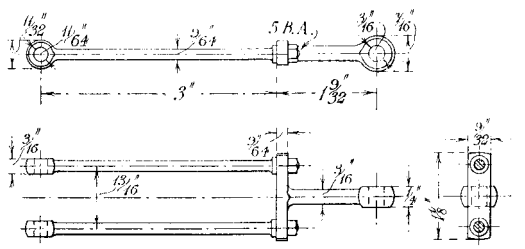


Fig. 32. Drag Links.

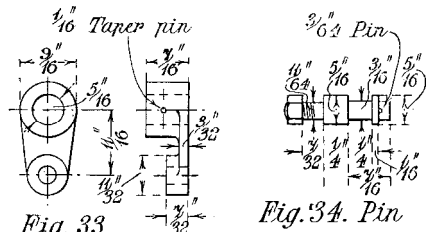


Fig. 33. Reversing Lever, M.S.

Fig. 34. Pin for Reversing Lever, M.S.

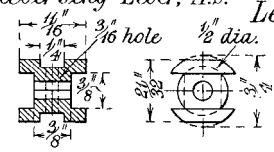


Fig. 36. Link Block

Details of Reversing Gear Components.

The top of the rod should be a good working fit into the top guides, and the largest diameter of the shank should be a good sliding fit into the bottom cover, gland, and guide bracket. The H.P. valve spindle is fitted with two loose washers, which are a push tit into the piston

-valve and a sliding fit on the valve spindle. The L.P. valve spindle is fitted with a plain washer. the exact thickness of which should be found when setting the valves. The link blocks, Fig. 36, are made of gun-metal and are in halves. The half-castings should be filed up flat at the joint, and soldered together for turning. They should first be drilled with a 3-16th-in. diameter drill and then 'turned up on the outside and faced at the sides. They should now be unsweated and the slots filed to suit the radius bars. Careful fitting will be required at this point. When thr link block is fitted into the valve spindle on assembling tha valve gear, it should be a working fit therein ant!, at the same time, the joint

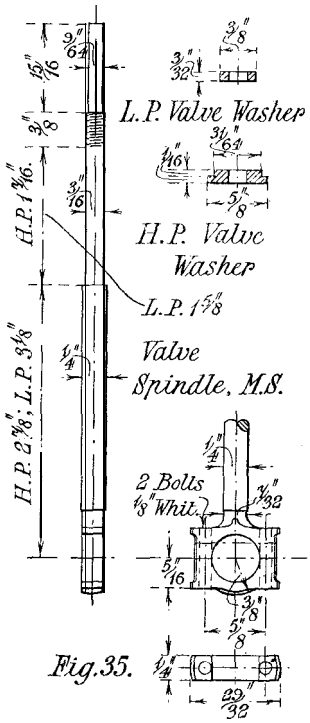


Fig. 35.

The H.P. and L.P. Valve Spindles and Washers.

of the link block should be quite close, so as not to grip the radius bars. This means that the joint of the link block should be adjusted so as to give a good fit on the radius bars and at the same time give a good fit in the valve spindle. Of course, the usual practice in link block design is to fit loose adjusting pieces on the top side of the radius bar, so that the link block can be adjusted on the radius bars without disturbing the fit between the block and the spindle,

The reversing shaft is carried in' brackets attached to the front columns. The end brackets are shown in Fig. 37. They are made of gun-metal and bored 5-16th in. diameter and faced to suit the reversing shaft and are tapped No. 5 B.A. for the securing studs. The centre bracket, Fig. 38, carries the reversing shaft and also the worm and worm shaft. The foot is drilled for two No. 5 B.A. bolts and tapped for one So. 5 B.A. stud. The lugs are drilled to suit the worm

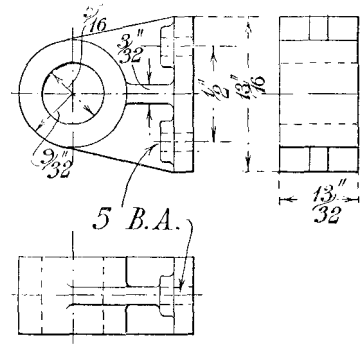


Fig. 37. Reversing Shaft Brackets, G.M.

Elevation and Plan of Reversing Shaft Brackets.

shaft and the sides faced. The boss is drilled 5-16th in. diameter and sides faced.

The reversing gear is shown in Fig. 39. The worm wheel is made from a gun-metal casting, and has twenty teeth No. 20 D.P. It should be first bored out 5-16th in. diameter to suit the revel-sing shaft and turned up to 15-32nd in.

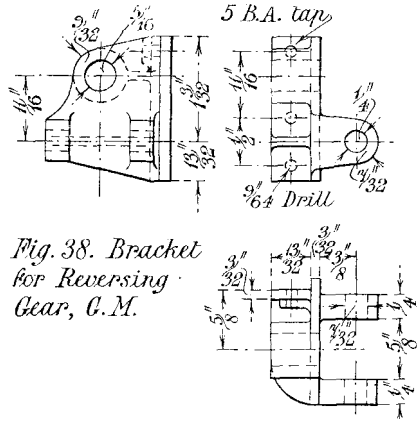


Fig. 38. Bracket for Reversing Gear, G.M.

Details of the Reversing Gear Brackets.

diameter to form the blank upon which to the teeth. The blank may be fixed on an arbor and held in the chuck for gashing the teeth with a cutter operated from the slide-rest. Alternatively the blank can be held on a fixed arbor attached to the slide-rest and the cutter mounted between the lathe centres. An index plate should be used to obtain accurate spacing of the teeth. (I notice a similar machining job is described in

the June 3rd issue of the *M.E.*, Vol. XLII, page 520.) The diameter of the cutter should be .608 in., and inclined to the axis of the worm wheel $5\frac{3}{4}°$. The worm is made from mild steel bar. It has a single thread of .157-in. pitch and a mean pitch diameter of .5 in. If a thread is cut either of $6\frac{1}{2}$ t.p.i. or 4 mm. pitch it will be sufficiently correct. The wheel is bored to suit the spindle and is drilled for two small taper pins. The spindle should be turned to a working fit into the bracket and a tight fit into the worm. It is located in the bracket with a collar at one end and a nut and washer at the other end. The front end is turned to fit the reversing wheel shown in Fig. 40. The wheel is a gun-metal casting and has four arms of elliptical section. The rim should be turned up and polished, and the boss bored out and faced. The handle is made of steel, and may be either screwed into the wheel and riveted over, or it may be driven in and secured with a nut. The wheel should be secured on the shaft with either a taper pin or a key 1-16th in. square.

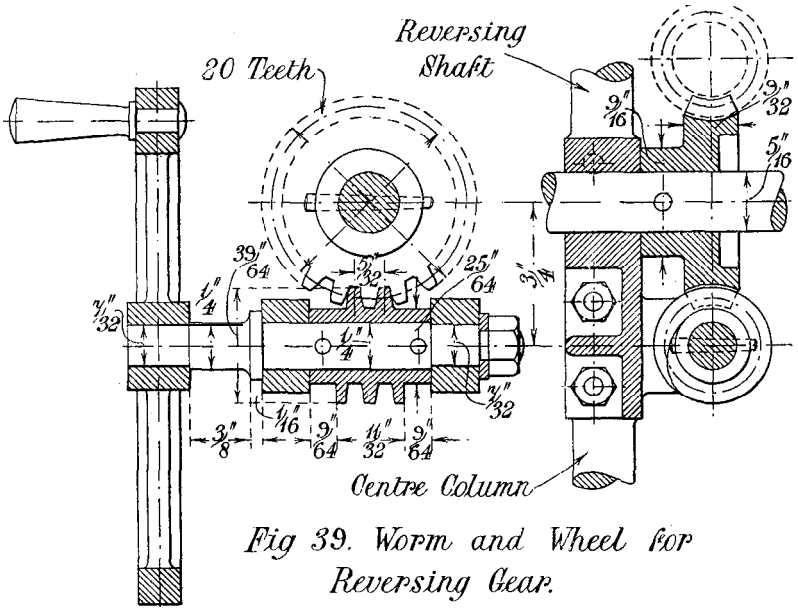


Fig 39. Worm and Wheel for Reversing Gear.

Part Sectional Side and End Elevation of Worm & Wheel for Reversing Gear.

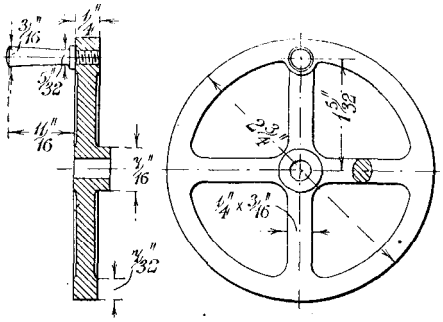


Fig. 40. Reversing Wheel

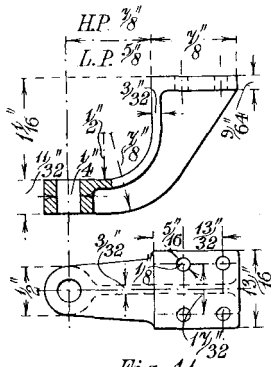


Fig. 41.

The Reversing Hand Wheel and Valve Spindle. Guide Brackets.

The valve spindle guide brackets, shown in Fig. 41, are gun-metal castings. The foot should first be machined level, which will then allow the casting to be set up true on the faceplate for

boring out. The foot has foar $\frac{1}{8}$-in. holes drilled in it, which should be marked off in position. It should be noticed that the dimensions of thr H.P. and L.P. brackets differ.

Having briefly described the parts required for the valve motion, let us revert back to the condenser. The condenser has 83 brass tubes, 611-16th ins. long by $\frac{1}{4}$ in. diameter by 26 S.W.G. thick. The tube plates should be attached to the condenser with six No. 5 B.A. countersunk screws in each. The tubes should be lightly covered with solder for a distance of about $\frac{1}{4}$ in. from each end and placed in position. The holes in the tube plate can be rcamered out slightly larger if the tubes are difficult to thread into place. When all the tubes have been fitted the tube ends should be permanently fixed by heating with a gas blowpipe and causing the molten solder to fill the joints round the tubes.

The condenser covers are shown in Fig. 42. They are made of brass. The shape of the covers is the same as the tube plates. The cover at the L.P. end of the condenser is provided with an oval flange near the bottom, but the cover at the other end is provided with a similar flange near the top. The cover is drilled to suit the studs in the condenser and should be marked off from the tube plate. Fourteen small bosses are provided on the outside radiused 'edge to suit the nuts and which should be faced with 9-32nd-in. diameter pin-drill. The covers should be faced at the joints and then turned over and the flanges faced. A 5-16th-in. drilled hole forms the inlet and discharge for the cooling water. Each flange is provided with two No. 5 B.X. studs for securing the inlet and discharge pipes. The covers can now be jointed to the condenser and secured with No. 5 B.A. nuts. Fig. 43 shows the cover for the circulating pump. It should be turned all over. It is a push fir into the body of the cir-culnting pump and is bored out for-the gland and rod. The gland is turned to a push fit into the stuffing box, and is also bored out to suit- the pump rod. The oval flange is drilled 9-64th in. to suit the adjusting studs, which are screwed into the cover.

(To be continued.)

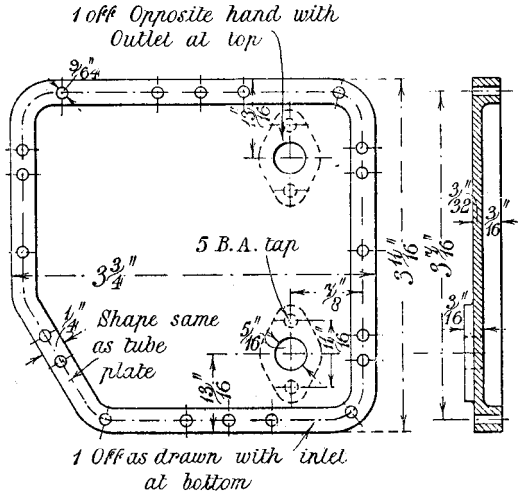


Fig. 42

The Condenser Covers.

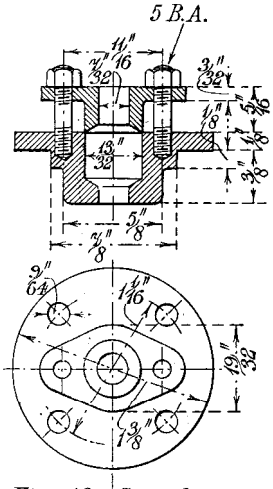


Fig. 43. Circulating Pump Cover, C.M.

Section and Plan o! Circulating Pump Cover.

The Horse-Power of Boilers.

The following note on this subject is prompted by the inquiry: On what basis is the h.p. of steam boilers calculated ? I am given that a vertical boiler 6 ft. 6 ins. long by 3 ft. diameter will evaporate 280 lbs. of water per hour from and at 212° F. This is called a 4 h.p. boiler (approximately). I cannot understand this being a 4 h.p. boiler as:—

280 lbs. per hour = $\frac{280}{60}$ lbs. per min.

As B.T.U.'s to evaporate 1 lb. of water from and at 212° F. = 966 and 1 B.T.U. = 778 ft. lbs.

$\frac{280}{60} \times \frac{966}{1} \times \frac{778}{1}$ = 3,507,224 ft. lbs. per min. and

3,507,224 ÷ 33,000 = 106 h.p. (approx.).

Can you explain to me why the horse-power calculated from the B.T.U.s generated by the boiler is 106 h.p. (or in what respect the calculation given is not correct) while the boiler is given as 4 h.p. ?

Boilers are still called so many horse-power in some catalogues; but this is, or ought to be, obsolete. The up-to-date method of describing the power of a boiler is to give its evaporative power and pressure at which it will work, then, knowing the efficiency of the engine which it is to supply, the size of boiler can be estimated.

The nominal h.p. of a boiler is calculated from some formula dating back to the period when it was thought extremely dangerous to work at 15 lbs. per sq. in. above the atmospheric pressure.

The combined efficiency of an engine and boiler depends upon the following particulars:

1. Initial pressure of the steam.
2. Dryness of the steam.
3. Type of engine-simple, compound, or triple.
4. The mechanical details and general construction of both the engine and boiler, including the care expended on the prevention of loss of heat by radiation.

Steam has a certain number of thermal units communicated to it in the boiler and after it has passed through the engine a certain (large) proportion of these thermal units still remain in the condensed steam, and it is only those thermal units which are absorbed in doing useful work in the engine that are to be counted upon to give the power.

To illustrate this take the case of a high-class simple engine using 20 lbs. of steam at 150 lbs.* per square in. and exhausting at 20 lbs. pressure.

†20 lbs. of saturated steam at 150 lbs. pressure contain 1191×20 B.T.U., from which must be deducted the latent heat of evaporation, 860×20 ... = 6,620 } Available B.T.U. in steam.

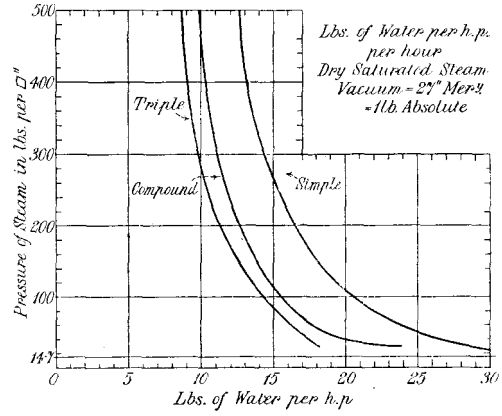
20 lbs. of saturated steam at 20 lbs. pressure contain $(1151-954) \times 20$ ... = 3,940

2,680 B.T.U.'s converted into power.

$$\frac{2,680 \times 778}{60 \times 33,000} = 1.05 \text{ h.-p.}$$

Now, this is the theoretical h.p of 20 lbs. of steam working between the limits of pressure set forth above and cannot be attained in practice because it allows nothing for the loss of heat through the walls of the cylinders or mechanical defects in the engine.

The diagram below gives the practical h.p. attained in high-class engineering practice, using



Curve of Water Evaporated per H.P. at Various Pressures

the steam from the pressures given down to an exhaust into a vacuum of 3 in.' mercury.

For further details concerning the expansion of steam see the *M.E.*, November 9, 1922, p. 440.

*The pressures given are absolute, i.e., including, atmospheric pressure.

†For the sake of simplicity the effect of condensation during expansion has been neglected. Steam expanding from 150 lbs. to 20 lbs. per sq. in. will require 954-860=94 B.T.U. to be added to each pound of it to keep it in the form of vapour, but on condensing (in the cylinder) the latent heat of evaporation is set free and communicated to the remaining steam in the cylinder.

Model Engineering Equipment and Supplies.

A Review of Current Technical Progress.

The "Gem" Lathe-Reversing Gear.

Mr. G. E. Morley, of 47, Amwell Street, Pentonville, London, N. 1, has put on the market a useful set of castings and material, including three cut gear wheels, for purchasers to make up a comprehensive form of detachable cluster gear, designed for attachment to the so-called reverse arm of a lathe.

Fig. 1 is a view of the complete gear made up, but, we understand, the idea is not to offer these completed in this form, but only to supply the material at an attractively low price. Fig. 2 is a photograph showing the same attachment set upon a 3½-in. screw-cutting lathe and in the neutral or mid position. It consists of two main castings, the quadrant or fixed portion (to the right in Fig. 1) and the lever, which carries the pinions (to the left in the same). In addition, there is material for the two pinion studs and main stud, spring plunger and the several nuts and bolts. The cut pinions supplied are 16 and 20, and the driven wheel 30, all of 14 d.p.

The arrangement is designed to use an extra

30 of the regular lathe set on the mandrel ; the gear ratio is then 1 to 1, and wheels are set up as usual from the cluster stud, or tumbler stud, of the gear. Mr. Morley supplies with the set a table of recommended settings for cutting from 8 to 40 t.p.i. inclusive, and approximate settings for cutting from .5 to 5 millimetres by means of a 63 wheel on screw, all applying to an 8 t.p.i. lead screw. We are not sure, but believe that working particulars are also given, but, in any case, the actual machining is not a great matter, and weli within the capacities of the generality of our readers.

There is a good deal to be said for this idea of Mr. Morley's, principally applying to the fact of using a detachable reverse gear. Many of the latest types of S.C. lathe are fitted with a fixed cluster gear to bring such lathes into line with regular workshop practice. To the home user of a lathe, however, the advantage of a fixed

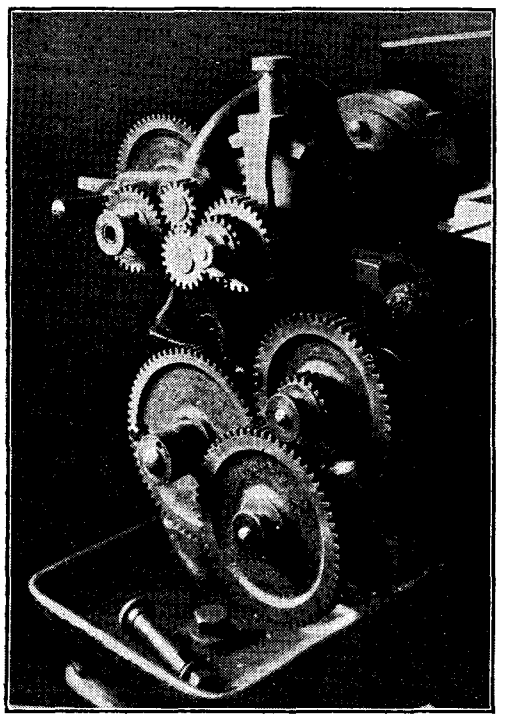


Fig. Z.-The Cluster Gear Mounted on the Reverse Arm of a 3½-in. Lathe.

reverse gear is largely outweighed by an important disadvantage. If he is going to use his lathe to its greatest capacity as a general workshop tool, he will find he is constantly wanting to use the mandrel end for dividing purposes, either by means of the wheels available or by the attachment of a division plate, or' by mounting some form of worm dividing gear. If there is a fixed cluster, all these attachments are out of order, because it is obviously impossible to use them through such a gear on account of the backlash in the teeth of same. With a detachable gear, however, which need only be mounted when changes of direction are constantly needed, or when the neutral gear is required frequently, the mandrel gear nose is free for such purposes ; and, not only this, the reverse arm slot and studs, which have a distinct use in most of the cases, is also available.

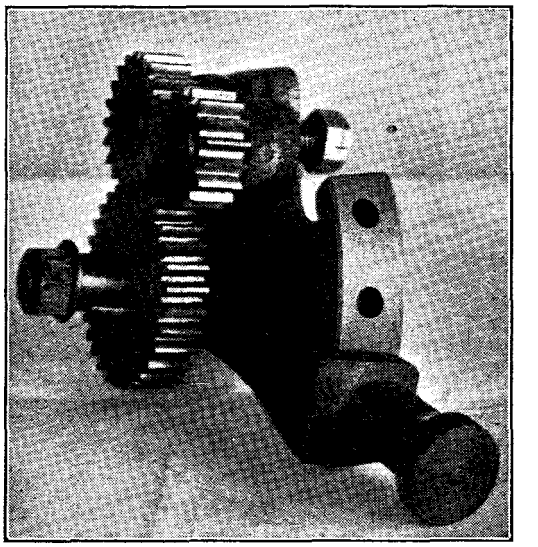


Fig. 1.—A Detachable Cluster Gear for Small Lathes.

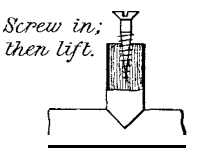
Another point is that the accidental degearing of a lathe by its cluster during screw-cutting operations can be largely obviated by detaching the gear in cases where it is not likely to be of much use.

Spirit Lamp Hint.

By SYDNEY LOVETT.

I submit the following "tip" in the hope that it may be useful to other readers of the *M.E.*

I have often experienced difficulty in



An Easy Method of Lifting Spirit Burner Wicks.

extracting wicks from the pilot burner in vaporising spirit lamps (when they have been accidentally pushed below the level of their tubes) and have recently found that they can be easily extracted by a thin wood-screw.

Radio Engineering.

Further Notes on Electrolytic Rectifiers.

A correspondent (J. J. J., of Wanstead) desires particulars of an electrolytic rectifier for accumulator charging purposes. As this subject has been discussed on two or three occasions, and further as it may be of interest to many amateurs who are now using accumulators pretty regularly in conjunction with their valve sets, some further notes giving the results of some recent experiments are given below.

Information on electrolytic rectifiers is not easy to obtain, i.e., information of much help, the textbooks treating the subject in more or less general terms ; and, as our correspondent states, electricians, as a body, seem to have little knowledge on the matter. The present writer's espcriences date back from some years ago, when he experimented, using the few hints he had been able to obtain from various sources. Results were not by any means satisfactory. During the last three years he has taken up the subject again, and with the help of some painstaking friends has made what appears to be some considerable advance.

The troubles all along may be divided into two classes ; (1) rapid deterioration of the electrodes and electrolyte ; and (2) excessive heating. At times, too, it seemed as though these two troubles were very closely related.

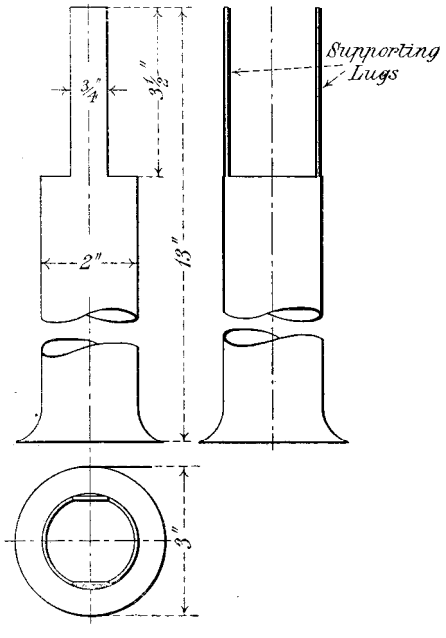


Fig. I.-Lead Electrode for Electrolytic Rectifier.

The first real advance was made after reading an article by E. T. Painton, B.Sc., in the *M.E.* of November, 1921. Here a capital device was described whereby, under proper conditions, troubles due to over-heating were eliminated. Acting upon the suggestions given in this article the writer, and the friends above mentioned, set to work on fresh lines, and with the addition of some (apparently original) further ideas, a really satisfactory arrangement has been evolved. Reference to the article mentioned will show that by suitably shaped and arranged electrodes a thermo-syphon device provided a means for dissipating much of the heat set up ; but in order that this device may bc really efficient it is essential that a relatively large body of electrolyte be employed, and further that the aluminium electrode shall be deep down in the liquid. This indicates the employment of a deep vessel. Consequently four tins were obtained from a local tinsmith. These are about 14 ins. high by 6 ins. diameter, have soldered seams and are painted dead-black outside. After several months of constant use they show no signs of deterioration from the action of the electrolyte. In use these tin containers are kept well apart in an airy position so that radiated heat can be carried off as rapidly as possible. The electrodes are carried from stout oak bars spanning the tops of the tins, shallow slots being cut for the edge of the tin to enter. The lead electrode is in the form of

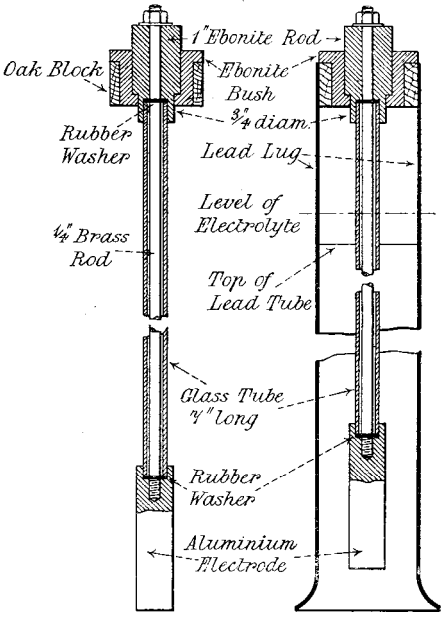


Fig. 2.—Aluminium Electrode for Electrolytic Rectifier.

Fig. 3.—Showing disposition of Electrodes in Electrolytic Rectifier.

a tube 2 ins. interns: diameter and shaped as shown in Fig. 1. Thtse tubes were made from sheet lead rolled up on a suitable mandrel and the joints "burned." This latter is probably unnecessary, a good close joint beaten together set-ving just as well. At any rate in one set where the "burnt" joint was omitted no difference could be noted. The upper lugs of the lead tube are screwed to the oak block and given aheavy coat of acid-proof enamel. The bottom end of the lead tube is belled out and there is about 1½ ins. clearance between this bell-mouth and the bottom of the containing vessel.

The aluminium electrodes were a great source of trouble. Considerable deep pitting was noticed with one set of electrodes, and in the writer's opinion this was largely due to the fact that this particular sample of aluminium was alloyed to some considerable extent with another metal. Probably it was one of the aluminium alloys now so common. Other samples have given hardly any trouble in this way, wearing away evenly and presenting a bright, frosted appearance. The method of suspension was always a source of some worry, too. Originally, the actual electrode was a short length of thick rod drilled and tapped at its upper end to take a length of ¼-in. diameter rod. The idea was that when the block was consumed a fresh one could be screwed on. The ¼-in. rod, which formed the suspension was covered with rubber tube. The curious fact, however, was that although this tube fitted quite tightly in the first place, it soon became a loose fit and the rod within it showed signs of wear. Now an entirely new method has been adopted. The electrode proper is a g-in. length of ¾-in. diameter rod bored down a short distance, the bottom of the hole being further drilled and tapped ¼-in. Whit. Into this screws a length of ¼-in. diameter brass rod, and over therod is slipped a length of thick-walled glass tube. The end of the glass tube beds on a rubber washer. The upper end of the brass rod passes through a short length of J-in. diameter ebonite rod which is bored at its lower end to take the glass tube, a rubber washer forming a seal as at the electrode. A nut above the ebonite rod draws everything up tightly. The ebonite rod passes into an ebonite bush fitted into the oak block, and is prevented from slipping through by a shoulder. Removal of the entire electrode is perfectly simple and good insulation is maintained. The glass tube is a water gauge glass, having an internal diameter of 5-16th in., an outer of about ½ in., and is 7 ins. long. Reference to Fig. 2 should make the method quite clear. The lower end of the electrode comes just to where the lead tube begins to bell out. The heated liquid and evolved gases rise up the interior of the tube and escape at the openings at its upper end, spreading out near the surface of the liquid, cooling all the time. Fig. 3 shows the disposition of the electrodes.

The electrolyte is a strong, almost saturated, solution of ordinary bi-carbonate of soda obtained from the local chemist. About ¾ lb. to the gallon is the strength used, evaporation being made good with boiled water. When the solution shows signs of getting muddy it is discarded and fresh used.

Four cells are used and connected, as shown in Fig. 4. The voltage at the mains is 220 and this is brought down to 50 by a step-down transformer. A voltage greater than about 130 is not permissible, while anything below about 40 is of little use. A lamp in series is used to indicate when the barrier film is formed. The accumulators are then switched in and the lamp shorted out. A rheostat is also in series with the rectifying cells to regulate current passing through them. Under no circumstances is this allowed to exceed 1.5 amps.-generally it is about 1 amp. Under these conditions the rectifier will run for several hours with very little temperature rise-a ten hour run is quite common. At the end of each run the aluminium electrodes are lifted out and scrubbed in hot water, otherwise an encrustation grows on them, and it almost seems that this encrustation is in

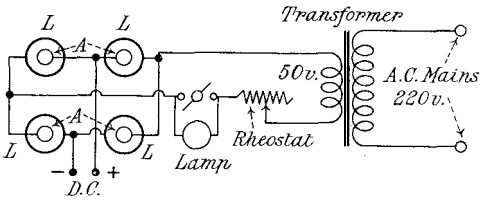


Fig. 4.-Diagram ef the Connections for Electrolytic **Rectifier.**

some way a factor in the rapid and irregular pitting before mentioned. Clean electrodes give a much more satisfactory life.

The accumulators generally in use are hardly ever allowed to run quite down. After a run of three or four hours (perhaps a little more occasionally) during the evening on three or four valves they are put on charge again during the day and soon come up to charge. Charging at 1½ amps. may seem slow work for an accumulator of 40 amp. hours. capacity-or over-but it is a certain charge, and the cells are always quite healthy.

* * *

Replies to Wireless Inquiries.

J. S. P. (East Grinstead).- As shown, your A.T.C. is in parallel with the A.T.I. ; put it in aeries, results will be much better. (2) It is very much better to have each valve independently controlled by its own filament resistance. The adjustment on the H.F. valve requires to be critical. (3) You must be very

careful with this set or your reaction will cause interference. (4) The H.F. transformer must be connected in correct position to give best results. If yours is of the " spool " type connect as follows :-I.P. to + H.T.; O.P. to plate; I.S. to grid of next valve; O.S. to - L.T. If you will refer to Figs. 47 and 48 in " Wireless Circuits" you will be able to arrange matters. You can omit the potentiometer control to grid.

G. K. (Dartmouth).-You should be able to get the broadcasting from Plymouth when this station gets going. In the meantime you should be able to get a great deal of marine traffic on 600 metres. Erect your aerial so that it is at right-angle to the telegraph wires, and as high as you can.

P. F. W. (Preston).—(1) Wind the primary inductance full nith No. 26 gauge wire, and the secondary full with No. 30. This should give you a range up to about 6,000 metres. (2) You are not well-advised in making up your loose-coupler as you suggest. It is much better to keep to the usual form. (3) Presuming the condenser vanes are of semi-circular outline, which you do not state, and also that the air-gap is about 1 mm., then maximum capacity will be about .0012 mfd. The amount of air-gap makes a great deal of difference

H. I-I. (South Shields).-You are not advised to proceed with the valve receiver, diagram of which you submit. It is not at all the type of circuit suitable for a beginner. It involves reaction directly coupled to the aerial circuit, and as you desire to use the set chiefly for broadcasting, this is the very circuit you may not use. Use the inductance you have and make up a circuit, as shown in Fig. 65 of " Wireless Circuits. " Wind the inductance full with No. 24 enamelled wire and fit a single slide contact. You will not require the condenser.

Prizes for Mineshaf t Signalling Devices.

The Rand Mutual Assurance Co., Ltd., Johannesburg, Transvaal, offers prize money not exceeding £250 for design or designs of the most practicable device for recording shaft signals in the mines Entrance is free and open to all, including mercantile firms. Entries close September 30, 1923. Copies of conditions of the competition may be obtained from J. F. Bilbrough, Managing Secretary, The Rand Mutual Assurance Co., Ltd., 3rd Floor Chamber of Mines Building, C.R., Main and Holland Streets, or P.O. Box 413, Johannesburg, Transvaal, South Africa.

L.G. (Reading) . . It is not easy. Apply to the G.P.O. for forms to fill in.

Practical Letters from our Readers.

Draw=bar Puli of Model Locos.

To THE EDITOR OF *The Model Engineer*.

DEAR SIR,—Mr. Merz is evidently not a railwayman, or he would not have stated in March 8 issue that " the one and only true *measure* of a loco.'s efficiency " is the drawbar pull obtained in the way he mentions.

The loco. superintendent of a railway cares very little about what his engines will shift from a dead standstill in the way suggested by Mr. Merz. What he *does* care about, however, is the load his engines will pull *and keep on pulling*, which is a very different matter. I will give an instance or two, both real and model.

Many years ago, somewhere about 1900, a little Brighton terrier named " Surrey " did duty in New Cross loco. yard as pilot (shunter, that is). Her boiler was in a very poor state, and she was unable to maintain steam sufficiently to work a passenger train, but she was quite all right for pulling " dead " engines about the yard. Sow, by letting her stand and blowing up to full pressure she could move a whole road of tender engines, seven or eight of them, say, over 500 tons ; and stiff and cold locos. at that. The drawbar pull to do this must have been enormous-so according to Mr. Merz she was the height of efficiency, although if she had gone out on a passenger train she would have stuck for steam before travelling a mile, and was condemned as unfit for service! Very " efficient " loco. that, was it not?

On one of our big railways where they sometimes used a van horse to shift coaches in the terminal sidings there happened one day to be a dynamometer car. While awaiting the loco. they were going to test, the occupants of the car thought it would be great fun to take the "drawbar pull " of the van horse, and they did so. He pulled, if memory serves me truly, equal to some seventeen or so mechanical horse-power. A very efficient horse-but how long could he keep it up? The pull was merely the strain of moving the car from rest ; one big effort only.

Reverting to models-if I took the boiler off my " Atlantic " and replaced it by an externally fired " pot " boiler of strong construction, with a methylated lamp underneath, it would be an easy matter to let her stand until the gauge showed the same pressure as she maintains with her coal-fired boiler, and then take the drawbar pull in the way suggested by Mr. Merz. The " pull" being the same, according to him the efficiency would be the same.

But what beautiful months this and February have been ; y-et my "Atlantic," with her coal-fired boiler works out of doors and maintains

her full pressure with her live loads. **Would** she do it with the "pot" boiler and methylated lamp? According to Mr. Met-z's test, the "efficiency" being the same, she would **!**

I should like to see a ton pulled by a "draw-bar pull of a few ozs." Myself and a boy plus two trollies wanted some humping over the track at the *M.E.* Exhibition, which at times owing to grease and sand mixture was like running over a tarred and sanded macadam road.-Faithfully J-ours,

"L.B.S.C."

The Origin of the Locomotive Blastpipe.

To THE EDITOR OF *The Model* Engineer.

DEAR SIR,—Like Mr. Solomon I have been waiting to see what answers appear to Mr. Cooper's letter, but as the follcwing information has escaped being mentioned I now give it for what it is worth.

Samuel Smiles, in his life of George Stephenson, describing Trevithick's locomotive, states on page 64: "The waste steam was thrown into the chimney through a tube inserted at right-angles, but it will be obvious that this arrangement was not calculated to produce any result in the way of a steam-blast in the chimney, and that Trevithick was not aware of the action of the blast in contributing to increase the draught is clear from the fact that he employed bellows for this special purpose, and at a much later date (in 1815) he took out a patent which included a method of urging the fire by means of fanners."

In the seventh edition of "The Steam Engine," by Dionysius Lardner, on page 325, is an illustration of Trevithick's engine showing the exhaust pipe entering the chimney at right-angles.-Yours faithfully,

R. F. HEWSON.

Insulating Varnish.

To THE EDITOR OF *The Model Engineer.*

DEAR SIR,—Please allow me a few words in reply to Mr. Bates on the above subject

First, he says an amateur cannot use a stove enamel. Why? Many amateurs do much more difficult jobs than that. All he wants is a thermometer, reading up to at least 300° Cent., a pot of varnish, an ordinary gas oven and the absence of the lady of the house. The rest is easy: follow the directions given with the varnish. The writer is not in love with shellac, even when sent out in sealed tins. It may be all right when put on, but will even then collect sufficient moisture from the air to cause trouble, especially when winding thickly superimposed turns of cotton- or silk-covered wires. These must be varnished as the layers are wound, and by the time the job *is* done the inner turns may have absorbed sufficient moisture to cause the trouble. Another thing against shellac is that it contains more acid than most gums and is therefore in itself a danger, especially where fine wires are employed. No gums are free from acids unless they are chemically treated, and this chemical treatment generally causes considerable deterioration in the other properties of the gum.

The best solution of the problem therefore seems to be to use some fossil gum, such as amber, which contains very little free acid, dissolved in some soivent that is inert in itself and has no affinity for moisture.

The writer has tried for years to find a solution of this problem, and has, he thinks, at last hit on the ideal mixture, but will not publish this till it has undergone further trial.

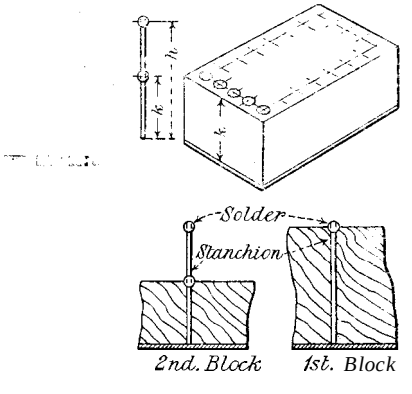
If expense is not considered, amber in ether is quite good for most electrical insulating jobs.—Yours faithfully,

THE WRITER OF THE ARTICLE.

Making **Model Ship Stanchions.**

To THE EVITOR OF *The Model Engineer.*

DEAR SIR,-With reference to Mr. Dunn's letter in your issue of February 22, I have, during the last few years, been constructing a steam yacht to a scale of ½ in. to the foot, and, even in this large scale, found the stanchions very tedious to make, until I tried the following method. I cut a number of pieces of brass wire, equal in length to the finished stanchion, plus a



"Jigs" for Making Model Stanchions.

small allowance to push into the deck. I next obtained blocks of wood, as shown in the sketch (Fig. 1), of thickness equal to distance from ends of stanchions to the various balls, and drilled about forty holes of the same diameter as wire in each, indenting the top ends slightly.

Starting with thickest block, I placed a wire in each hole and then passed a small iron along the rows, putting a spot of solder on each in turn, repeating the process for each thickness of block. With care, all the balls can be made

similar and, of course, the blocks fix the positions. I next pin-drilled them and gave them a thick coat of good white enamel. The final result, after the enamel had set, left nothing to be desired, and the stanchion trouble was disposed of in a couple of days.

Trusting this will be of use to Mr. Dunn.--Yours faithfully, ROBERT COCKS.

Trouble with Spirit-fired Loco.

TO THE EDITOR OF *The Model Engineer.*

DEAR SIR,—I am building a gauge 1 tank locomotive (4—4—2 type) and am in difficulties with the lamp.

It has three rectangular burners, fed by a 3-16th-in. pipe. The spirit is fed from the supply tank (contained in the rear bunker), by atmospheric feed, as described in *M.E.* for December 28, 1922, only, of course, on a smaller scale. The trouble is that the lamp will burn all right for about two minutes, and then starts flaring up and dying down in spasms, sometimes dying out altogether, although next second there is plenty of spirit in the wicks.

It does not matter how I alter the amount of supply or the packing in the burners (asbestos, by the way) the result is the same. I have tried various qualities of spirit, but still get no better results.

I have no fellow enthusiast near to whom to take my troubles. I dare say the remedy is simple enough, but it wants finding, and perhaps some more experienced loco. man has found it. There is only one model loco. builder near, and he is building a fire-tub?. coal-fired boiler. So I can get no help in the way of spirit burners from him.—Yours faithfully,

Derby. CHARLES R. JENKINS.

Finishing Iron Work.

TO THE EDITOR OF *The Model Engineer.*

DEAR SIR,—I would be pleased if some of your readers could confirm the details of the following method of finishing iron work in small scientific instruments. The surface is first smoothed so as to remove the sand, etc., and then is coated with black lacquer or some similar matt black ; then a thin coat of " Tung " oil is put on, this expands in drying and produces a " crystallised " effect on the paint work. I have been unable to obtain " Tung " oil in Liverpool and so could not try the method. Perhaps someone in the model trade can supply this, if so, I should be pleased to hear from them.-Yours truly,

H. H. W.

Planished Steel Plate.

TO THE EDITOR OF *The Model Engineer*

DEAR SIR,—We note in your issue of March 15 a difficulty experienced by a correspondent, Mr. E. Heckman, in regard to the supply of small quantities of model engineering material. We take the earliest opportunity of informing you that we shall be most pleased to supply any material in any quantity to suit requirements, no matter how small. If we have not the material in stock no doubt we should be able to get it. If your correspondent will only communicate with us we are sure we can satisfy him.-Yours faithfully,

The Hobran Engineering Co., Ltd.,
A. F. MORGAN, Manager.
Shelsley Works, Bilston Road,
Wolverhampton

Society and Club Doings.

Secretaries are notified that all notices of forthcoming meetings must reach us 10 days previous to date of publication of any given issue.

Model Engineering.

The Society of Model & Experimental Engineers.

On Wednesday, March 14, about 90 members were present at the ordinary meeting at Caxton Hall. Five new members were elected. The chairman announced that Lieut. Barker had presented a 3½-in. Drummond lathe with accessories for the use of the members and that it had been arranged that the small 2½-in. plain lathe, in the Workshop should be offered in competition for the best work done in the workshop during the coming year. It was also announced that Mr. F. W. Pringle had presented to the workshop a set of parallel reamers. The Chairman then called for designs for the reconstruction of the straight locomotive track. The essential conditions are : stability-as the track will often be carrying passengers and we must not let them down—light weight, ease of erection and dismantlement, absence of loose parts, and small stowage space. The height will be about 3 ft. and sections should not be more than 5 ft. long. Any member who can submit a complete design or suggestions, please communicate with the Secretary as soon as possible. Mr. R. Proctor Mitchell then delivered his lecture on the "Ravenglass and Eskdale Miniature Railway," illustrated by a large number of lantern slides. He recounted the history and vicissitudes of the railway from its earliest days to the present time, described the class of traffic and the special difficulties in working it, and gave details of the locomotives and rolling stock. The line, which is 15-in. gauge, has heavy gradients, up to 1 in 30, and severe curves, but in spite of that the mail and express passenger trains do good time. It is 7 miles 2 chains in length, is a single line, with 4 passing places and 6 stations. Incidentally he referred to the controversy whether superheating affected the water consumption and stated that their locomotives had hairpin superheaters and when these

were shut-off the water consumption goes up 1½ to 20 per cent. At present extensive arrangements are being made to deal expeditiously and economically with the output of some stone quarries which are being opened up. A quantity of reinforced concrete work is being done, old steel rails, well scratch-brushed, being used, the columns being 22 ft. high, 12 ins. by 12 ins. The stone traffic to be handled is expected to be 12,000 tons per annum. Nearly all the work for the railway, aith the exception of the locomotive building, is done by their own men on the spot. The lecture was entertaining and highlv instructive, and the lecturer was heartily thanked.

FORTHCOMING MEETINGS.—At Caxton Hall, Westminster, commencing at 7 o'clock promptly. On Wednesday, April 11, locomotive and stationary engine nights (members please remember and bring along the needful). Lecturettes by Mr. L. M. G. Ferreira, who will throw some light on "Injectors," and Mr. H. E. Taylor on "Fits," on Wednesday, May 2; on Wednesday, May 31, Mr. J N. Maskelyne will speak on "The Sense of Proportion and Its Bearing on Model Locomotives and their Work." On Tuesday, June 26, Admiral Sir R. H. S. Bacon, K.C.B., K.C.V.O., D.S.O., will deliver his Presidential address.

WORKSHOP.—The workshop will be closed for Easter on Saturday, March 31, and Tuesday, April 3.

Secretary, F. H. J. BUNT, 31, Mayfield Road, Gravesend, Kent.

The Glasgow Society of Model Craftsmen.

(Meeting place : Royal Technical College.)

On March 8 a lecture on "Wireless Apparatus" was given by A. G. Fisher, Esq., convenor of the wireless section and his assistant, Mr. Tex T. Duncan. There being no aerial at the College, a "Ducon" was used and results testified to its efficiency. This was used along with Mr. Fisher's 2-valve set and another 2 low-frequency valve set (lent), and an "Amplion" loud-speaker. This "Amplion" was without a horn, so a search among the members resulted in the discovery of a gramophone horn (long since bereft of the mechanism of speech, which used to delight our prehistoric forebears). This was pressed into service by means of a rubber adapter.

It was the wireless section's night out and they rose to the occasion. Mr Fisher and his merrie men were cordially thanked

The nest meeting will be held on April 12, in rooms at 222, Sauchiehall Street ; the subject will be "Propellers," and will be dealt, with by J. W. Smith, Esq.

D. C. YOUNG, Honorary Secretary 198, Berkeley Street, Glasgow.

Birmingham S.M. & E.E.

Workshop at 16, Cornwall Street.

The next monthly meeting of the above Society will be held in Room 40, Guildhall Buildings, Navigation Street, on April 4, at 8 o'clock prompt. Will prospective members please apply to the Hon. Secretary for visitors ticket for that date.

A very interesting wireless discussion arose at our last meeting and many practical and useful kinks were brought to our general knowledge ; indicating that our members are well ahead in the wireless branch of applied science. Will members please bring their latest in wireless. I find from observation that our members are doing more "listening-in" than model making, so for the present we must I suppose let our old and tried friend, steam, remain in the background.

We are expecting great developments shortly, not in wireless but in real constructional mechanics, but this for the present is a dark horse.

T. J. HIGGINS, Hon. Secretary, 14, Kingston Road, Small Heath.

News of the Trade.

The "Escentro" Crystal Detector.

Messrs. Grafton Electric Co., of 54, Grafton Street, Tottenham Court Road, W.1, are listing, at the modest price of 12s. 6d., an extremely interesting form of crystal holder and sensitive spot finder, which will appeal to all users of this favourite form of wireless detector.

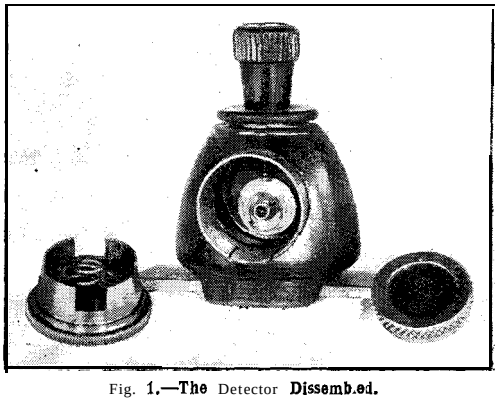


Fig. 1.—The Detector Dissembled.

Fig. 2 is a general view of the instrument. It is of solid ebonite, spinning-top shape inverted, and stands, with the milled handle, 1¾ ins. high. The brass clips projecting from each side at the base are electrically disconnected from each other and form the two terminals. One is connected with the crystal holder—the

round box with milled edge in front-and the other goes to the adjustable "cat whisker," which is controlled by the ebonite milled handle at top. Dealing with the crystal holder first, it will be noticed that the ebonite body is blind-holed transversely through and centrally. This hole is about ¾ in. diameter and passes to a blind end rather upon the further side of the centre, and is partially lined with a thin brass tube driven in tightly. The tube is in electrical con-'tact with one of the terminal poles, and is further saw-cut at bottom to take a push-in spring fit the actual crystal box (to the left in Fig. I). The latter is of thin brass and contains a conical spring, intended to keep the crystal, which is laid upon it, hard up against the cover. The cover (to the right) clips tightly into the front opening of the box and is made with a circular concentric opening about 5-16ths in. diameter. Across this opening is stretched a

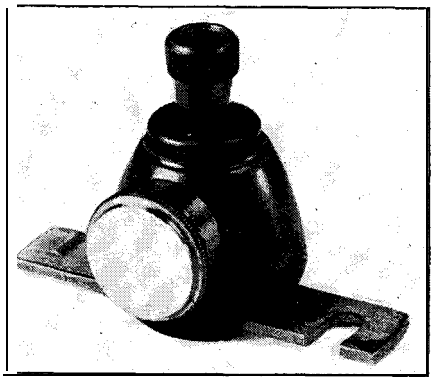


Fig. 2.—The Detector Closed.

fine mesh fabric resembling black cotton. The mesh holds the crystal back and allows the "cat-whisker" contact to pass through it and on to the crystal.

It is, however, in the mechanical application of the contact that this little appliance is remarkable. The "cat-whisker" is in the form of a fine brass spring attached to a disc of brass (seen in Fig. 1). The point of the spring is set about 1-16th in. out of centre of the disc. The disc is in one with a holed boss and is free to revolve and reciprocate on a brass stud fixed in the ebonite on the other side of the blind hole, which stud goes to the other terminal. The whole of this appliance is centred eccentrically downward in relation to the orystal. Behind the disc is a spring, which tends always to keep the contact forward against the crystal. Ths controlling device is on a vertical spindle, in one with the ebonite head. At the bottom end of this spindle is a little disc crank with a pin, which pin, as the spindle is revolved, allows the contact disc to advance forward to the crystal, or depresses it backward against its spring, and out of contact. The pin of the controller is in the form of a small steel pinion, being sharply milled, so that as it presses the disc back it gears with its surface and gives it a bare 1-5th of a tunn. The effect of this is to continually place the "cat whisker" at a different point in its circle of movement, which, being eccentric with the crystal, allows, in time, of the finding every spot on that circle. When the operator has exhausted all these tests he only has to give the crystal box a slight turn and then presents an entirely new area for the contact circle.

The detector is of French design and manufacture, very nicely made, and it appears that the three claims put forward by the vendors that it is "dustproof," "shock-proof" and "foolproof" are fully justified.

Special Tool Bargains.

Mr. Geo. Adams, 255-6, High Holborn, London, W.C.1, has just issued a list of special tool bargains. It is fully illustrated and clearly priced and runs to 16 pages. A wide selection of goods are offered, some of which will interest the model maker, some the carpenter and joiner and some the workers in various other trades and handicrafts. It will be sent to any of our readers post free, rd.

Notices.

The Editor invites correspondence and original contributions on all small power engineering, motor and electrical subjects. Matter intended for publication should be clearly written on one side of the paper only, and should invariably bear the sender's name and address. It should be distinctly stated, when sending contributions, whether remuneration is expected, or not, and all MSS. should be accompanied by a stomped envelope addressed for return in the event of rejection. Readers desiring to see the Editor personally **can only do so by making an appointment in** advance.

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Contents.

The asterisk (*)*denotes* that ***the subject is illustrated.***